



# OVERHEAD CRANE OPERATOR

*Valley & crown*

## Student Workbook



CRANES | RIGGING | LIFT PLANNING | ENGINEERING

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# OVERHEAD CRANE OPERATOR



**CRANES | RIGGING | LIFT PLANNING | ENGINEERING**

Developed & Produced For  
Industrial Training International, Inc.  
P.O. Box 1660

Woodland, WA 98674  
360.225.1100 • [www.iti.com](http://www.iti.com) • Fax 360.225.1122

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## Purpose & Scope

The purpose of this training is to provide trainees with the knowledge and skill necessary to properly operate overhead cranes and move loads using slings and other rigging hardware.

The program covers overhead crane preoperational inspection, hand signals, rigging gear selection and load control.

The morning session consists of classroom training. The afternoon session is hands-on application.

## Program Objectives

1. The trainee will be able to recognize and understand the component functions of an overhead crane.
2. The trainee will be able to complete a daily inspection on an overhead crane.
3. The trainee will be able to operate all the controls and resulting motions of an overhead crane.
4. The trainee will be able to determine crane movement and load handling activities which can be classified as good or poor operating practices.
5. The trainee will be able to demonstrate and follow hand signals.
6. The trainee will be able to select proper sling length and be able to choose the sling configuration to maintain control of the load.
7. The trainee will demonstrate proper practices in successfully rigging and moving a variety of test loads using an overhead crane.

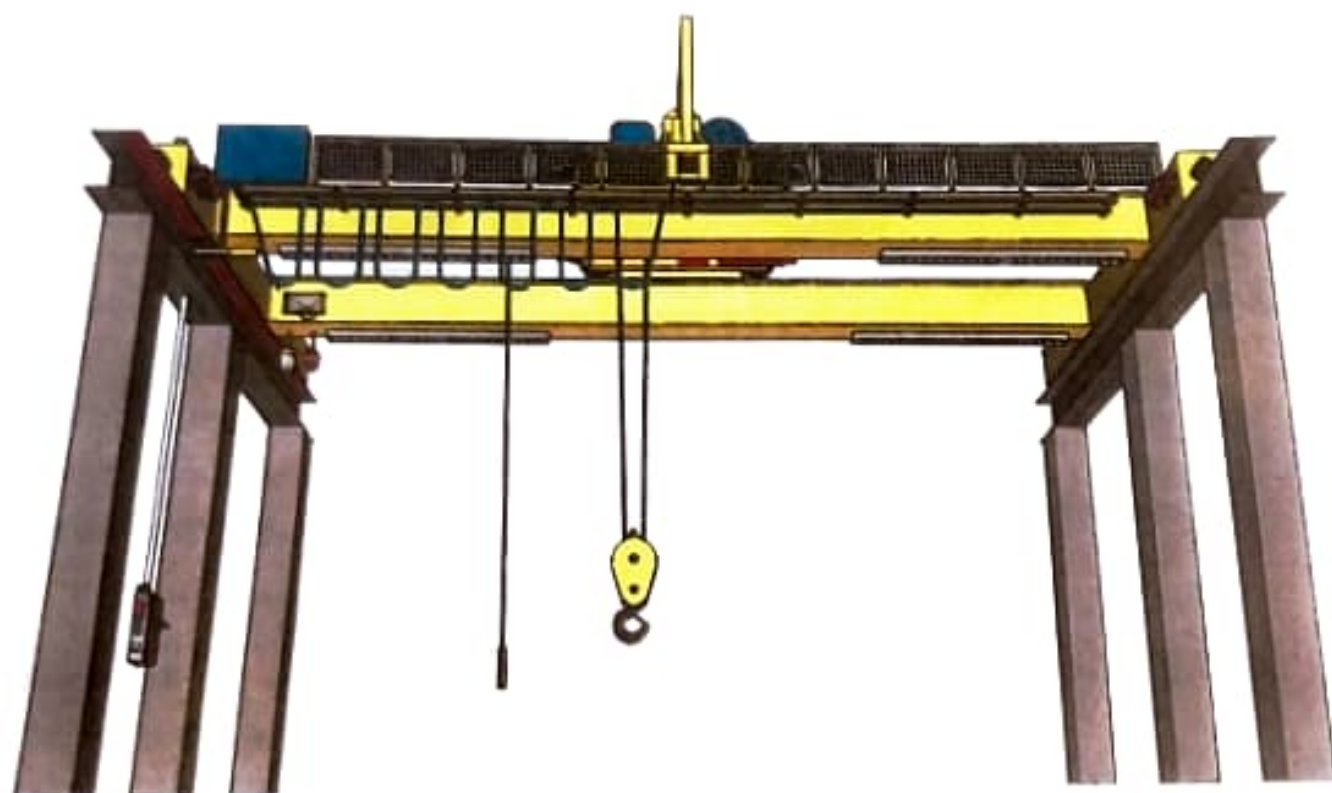
## CHAPTER 1

# Introduction to Overhead Cranes

### Chapter 1 Objective:

The trainee will be able to recognize and understand the component functions of an overhead crane.





Notes:

Lined area for notes, consisting of approximately 15 horizontal lines.



## Terms & Definitions

**Adequate Lighting:** Illumination provided by man-made or natural source of sufficient candle power to view the crane, its work environment, the load, and its travel path.

**Appointed:** Assigned specific responsibilities by the employer or the employer's representative.

**Authorized:** Appointed by a duly constituted administrative or regulatory authority.

**Brake, holding:** A friction brake for a hoist that is automatically applied and prevents motion when power to the brake is off.

**Brake, mechanical load:** An automatic type of friction brake used for controlling loads in a lowered direction. This unidirectional device requires torque from the motor to lower a load but does not impose any additional load on the motor when lifting a load.

**Brake, parking:** A brake for bridge and trolley that may be automatically or manually applied to impede horizontal motion by restraining wheel rotation.

**Bridge:** That part of a crane consisting of one or more girders, trucks, end ties, footwalks and drive mechanisms which carries the trolley or trolleys.

**Bridge Structure:** The part of a crane consisting of girders, walkways, railings, trucks, and drive mechanisms, that carries the trolley or trolleys.

**Bumper (buffer):** A device for reducing impact when a moving crane or trolley reaches the end of its permitted travel or when two moving cranes or trolleys come into contact. This device may be attached to the bridge, trolley, or runway stop.

**Cab, normal:** Operator's compartment used for controlling a cab-operated crane.

**Collectors, current:** Contacting devices for collecting current from runway or bridge conductors.

**Conductors, bridge:** The electrical conductors located along the bridge structure of a crane that transmit control signals and power to the trolley(s).

**Conductors, runway (main):** The electrical conductors located along a crane runway that transmit control signals and power to the crane.

**Control Braking Means:** A method of controlling lowering speed of the load by removing energy from the moving load or by imparting energy in the opposite direction.

**Controller:** A device, or group of devices that serves to govern, in a predetermined manner, the power delivered directly to the apparatus to which it is connected.

**Crane Block:** A frame holding a sheave or sheaves over which a rope can operate.

**Crane Hook:** A curved metal piece used on the end of a rope or chain or on a block. The standard hook is the J-shaped type which is used on the main load lines of all types of hoists, blocks, and so forth. Safety hooks are equipped with latches to prevent the load from slipping out of the throat of the hook. Various shank types are available on most hooks.

## Terms & Definitions (continued)

**Crane, Overhead:** A crane with a single or multiple girder movable bridge which carries a movable or fixed hoisting mechanism and travels on an overhead fixed runway structure.

**Crane, Standby:** A crane not in regular service that is used occasionally or intermittently as required.

**Designated:** Selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

**Drum:** The cylindrical member around which the ropes are wound for lifting or lowering the load.

**Equalizer:** A device that compensates for unequal length or stretch of a rope.

**Festoon or Conductor/Collector:** The electrical conductors located along a crane runway that transmit control signals and power to the crane.

**Hoist:** A machinery unit that is used for lifting or lowering a freely suspended (unguided) load.

**Hoist Drum:** The cylindrical member around which the ropes are wound for lifting or lowering the load.

**Hoist Motion:** Motion that lifts or lowers a load.

**Hook, latch equipped:** A type of hook with a mechanical device to close the throat opening of the hook.

**Girder, drive:** The bridge girder to which the bridge motor and gearcase(s) are attached. For cranes having a drive on each girder, it is the girder to which the control panels and/or the cab are attached.

**Inch (Inching) (See "Jog"):** Often used incorrectly to refer to "creep speed".

**Jog (Inch):** To move the hook, trolley, or bridge in a series of short discontinuous increments by momentary operation of a controller.

**Lifting Devices:** Devices that are not reeved onto the hoist ropes, such as a hook on buckets, magnets, grabs and other supplemental devices used for ease of handling certain types of loads. The weight of these devices is to be considered part of the rated load.

**Limit Switch:** A device that is operated by some part or motion of a power-driven hoist, trolley, or bridge to limit motion.

**Master Power Disconnect:** An electrical service box which contains a breaker used to interrupt power to the crane.

**Normal Operating Conditions (of cab-operated cranes):** Conditions during which a crane is performing functions within the scope of the original design. Under these conditions, the operator is at the operating control devices and there is no other person on the crane.

**Normal Operating Conditions (of floor-operated cranes):** Conditions during which a crane is performing functions within the scope of the original design. Under these conditions the operator is at the operating control devices that are attached to the crane but operated with the operator off the crane and there is no other person on the crane.

**Parts of Line:** The number of lines of rope supporting the load block.

**Pendant Control:** A device, that serves to govern, in a predetermined manner, the power and movement of the apparatus to which it is connected.



## Terms & Definitions (continued)

**Pendant Station:** Controls suspended from the crane for operating the unit from the floor.

**Plug:** To operate a controller in such a manner that the motor line voltage polarity or phase sequence is reversed before the motor rotation has stopped, thereby developing a counter torque which acts as a retarding force.

**Primary Upper Limit Device:** The first device that, when actuated, limits hoisting motion in the upward direction.

**Qualified Person:** A person who by possession of a recognized degree or a certificate of professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

**Rated Load (capacity):** The maximum load designated by the manufacturer for which a crane or individual hoist is designed and built.

**Rope:** Refers to wire rope unless otherwise specified.

**Runway:** An assembly of rails, beams, girders brackets, and framework on which the crane travels.

**Runway/Rails/Columns:** An assembly of rails, beams, girders, brackets, and framework on which the crane travels.

**Right-hand End:** A reference to parts or dimensions on the viewer's right of the centerline of span, established when facing the drive girder side of the crane.

**Service Platform:** A means provided for workers to perform maintenance, inspections, adjustments and repairs of cranes.

**Shall:** This word indicates that a rule is mandatory and must be followed.

**Sheave:** A grooved wheel or pulley used with a rope to change direction and point of application of a pulling force.

**Sheave, non-running (equalizer):** A sheave used to equalize tension in opposite parts of the rope. Because of its slight movement, it is not termed a running sheave.

**Should:** This word indicates that a rule is a recommendation, the advisability of which depends on the facts in each situation.

**Side Pull:** The portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.

**Span:** The horizontal distance, center to center, between runway rails.

**Stop:** A device to limit travel of a trolley or bridge. This device normally is attached to a fixed structure and normally does not have energy-absorbing ability.

**Switch, main (crane disconnect):** A switch on the crane controlling the main power supply from the runway conductors.

**Trolley:** The unit that travels on the bridge rails and supports the load block.

**Truck:** A unit consisting of a frame, wheels, bearings and axles that supports the bridge girders, the end ties of an overhead crane, or the sill of a gantry crane.

**Two Blocking:** Inadvertent physical contact between the load block and the upper block or other parts of the trolley.

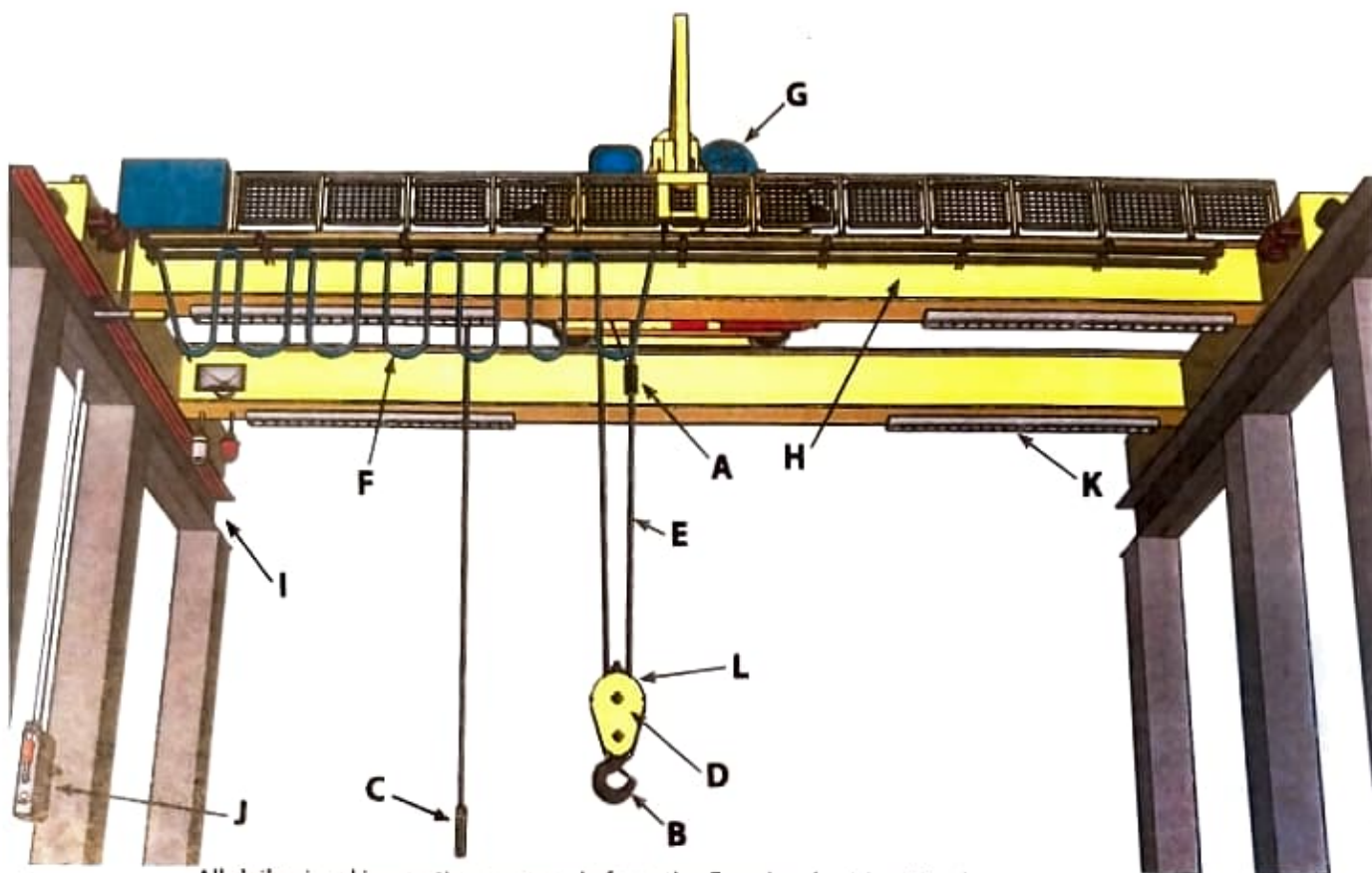
### Terms & Definitions (continued)

**Unattended:** A condition in which the operator of a crane is not at the operating control devices. However, on a floor-operated crane, if the operating control devices are within sight of the operator and within a distance equal to the span of the crane, the crane should be considered attended.

**Wire Rope:** A rope made from steel or metal wires formed into strands which are, in turn, laid into the complete rope. Sometimes referred to as cable.

**Notes:**

## Components of an Overhead Crane



All daily visual inspections are made from the floor level, without tools.  
Directions: Match the components on the left to the terms on the right.

### Components

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_
- F. \_\_\_\_\_
- G. \_\_\_\_\_
- H. \_\_\_\_\_
- I. \_\_\_\_\_
- J. \_\_\_\_\_
- K. \_\_\_\_\_
- L. \_\_\_\_\_

### Terms

- 1. Hoist Drum
- 2. Sheaves
- 3. Wire Rope
- 4. Master Power Disconnect
- 5. Limit Switch
- 6. Crane Block
- 7. Runway/Rails/Columns
- 8. Crane Hook
- 9. Bridge Structure
- 10. Pendant Control
- 11. Adequate Lighting
- 12. Festoon or Conductor/Collector



**Notes:**

## CHAPTER 2

# Daily Inspections

### Chapter 2 Objective:

The trainee will be able to complete a daily inspection on an overhead crane.



## Overhead Crane Daily Checklist

Crane No: \_\_\_\_\_ Location/Column: \_\_\_\_\_  
 Type: \_\_\_\_\_  
 Crane/Hoist Capacity: \_\_\_\_\_  
 Operator: \_\_\_\_\_ Clock No: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_

S = Satisfactory    U = Unsatisfactory    NA = Not Applicable

Action	Items	S	U	NA
1. Start	a. Operator must be qualified			
	b. Locate crane switch for disconnect			
	c. Crane control matches hoist			
	d. Control box is marked and in good condition			
	e. Red power light is on			
2. Start-up	a. Horn sounds and green light illuminates			
3. Move crane in all directions: north, south, east, west, up, down	a. Direction lights illuminate when crane responds			
	b. Movements are smooth, brakes acceptable			
4. Check limit switches	a. Raise block. Hoist should stop before contacting paddle arm			
	b. Lower block. Hoist should stop before contacting floor			
5. Inspect hook and wire rope	a. Inspect hook for rotation and wear			
	b. Check wire rope for general condition, spooling			
	c. Check block and sheaves			
	d. Check trolley, bridge, rail stops and runways			
6. Inspect electrical cables	a. Inspect cable and connecting plugs for wear and exposed wires, bent pins or crushed components			
7. Unusual noises or actions	a. Note any unusual noises, grinding, chattering, high whining or squealing			

### Comments

\_\_\_\_\_  
Signature

If any problems are noted, tag out the crane control and call Maintenance.



## Daily Inspections

- There are three (3) main types of inspections that concern operators. They are:

\_\_\_\_\_

- Documentation Required? \_\_\_\_\_

\_\_\_\_\_

- Documentation Required? \_\_\_\_\_

\_\_\_\_\_

- Documentation Required? \_\_\_\_\_

- During a daily inspection you are only required to conduct a visual inspection. This is often performed from the floor. There is no need to climb or use an aerial work platform (AWP). If using a personal fall arrest system (PFAS) or AWP is needed, you are going beyond the requirements of a visual daily inspection.

- o Cab operated cranes may give you more access to various crane components but you're still only required to do a visual daily inspection.

- o Some corporate or site policies may require more in-depth daily inspections.

- No tools are required for daily inspections.

- A typical daily overhead crane inspection should take between 5 and 20 minutes based upon the following:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Notes:

\_\_\_\_\_

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\_\_\_\_\_

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## Main Power Disconnect

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## Pendant Control

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## Remote Control

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## Crane Cabs

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## Upper Limit Switch



## Warning Systems



## Columns, Runways & Rails



## Festoon or Conductor/Collectors



## Bridge Structure



## Trolley





## Drums



## Wire Rope



## Crane Block

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## Sheaves

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## Hook

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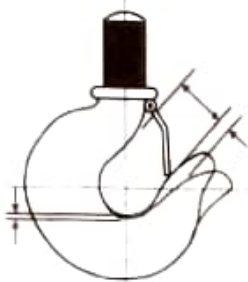
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## Adequate Lighting

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Notes:

## CHAPTER 3

# Control Functions

### Chapter 3 Objective:

The trainee will be able to operate all the controls and the resulting motions of an overhead crane.



## Learning the Controls

**CAUTION:** The crane operator should only operate the main disconnect if site specific policies allow anyone other than qualified personnel to do so.

**Step 1.** Open the main disconnect and with power off, operate each push button or master switch in both directions to get the "feel" of each device, since crane controls differ greatly. At the same time, the trainee will be able to determine if the device is stuck or in a bind.

**Step 2.** After making sure the area is clear, close the disconnect and then operate with the power on.

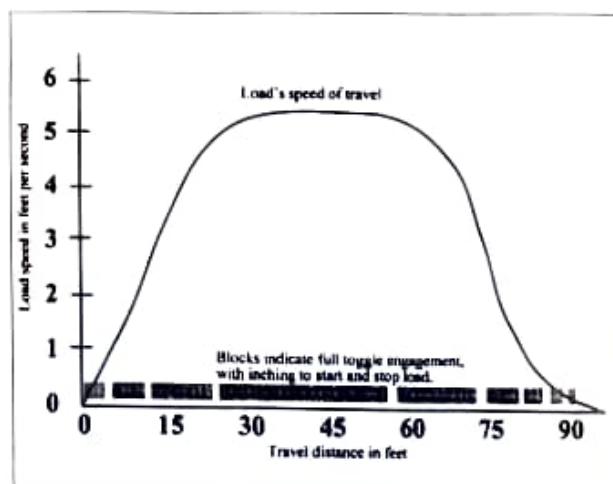
**Step 3. (Hoisting)** Try the hoisting motion first. The hook should be in an intermediate position. Move the master control or push button slowly up or press the "down" button in the pendant. The resulting movement should correspond with the master switch or push button markings. Observe the speed increase in relation to the steps in the controller. Try to feel the steps or detents in the controls. Start all motion slowly, step-by-step, until the fastest safe speed is reached. Stop slowly, step-by-step, to minimize unnecessary wear contacts and brakes.



**Step 4. (Trolley)** Repeat Step 3 with the trolley. Start and stop slowly to minimize wear on the brakes and electrical components.

**Step 5.** If the trolley or bridge is not equipped with a brake, you can still spot the load accurately and stop smoothly by "plugging". Learn to judge the drift of each motion of the crane after power is removed. Proper use of drift will facilitate spot of the load, reduce the need for plugging, minimize swinging of the load and reduce wear on crane components.

**Step 6. (Bridge)** Repeat Step 3 with the Bridge Structure. Operators must be familiar with both motions, as each one has its own characteristics. Always **LOOK UP** to ensure a clear travel path.





## CHAPTER 4

# Crane Operating Practices

### Chapter 4 Objective:

The trainee will be able to determine crane movement and load handling activities which can be classified as good or poor operating practices.



## Operating Rules



1. Be sure everyone in the immediate area is clear of the load and aware that a load is being moved.



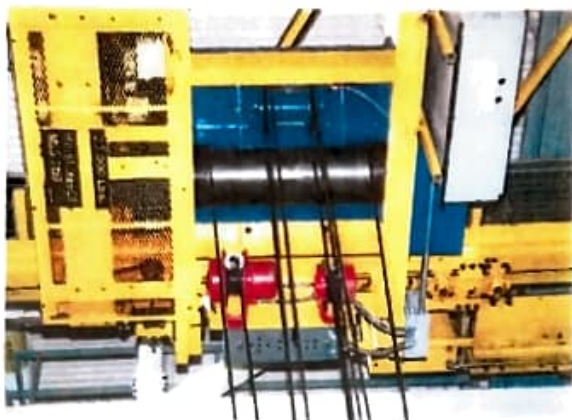
2. Cranes should be moved smoothly and gradually to avoid abrupt, jerky movements of the load. Slack must be removed from the sling and hoisting ropes before the load is lifted.



3. Center the crane over the load's Center of Gravity (C/G) before starting the hoist to avoid swinging the load as the lift is started. When setting the load down, loads should not be swung into areas the crane cannot reach.
4. Crane hoisting ropes shall be kept vertical. Cranes shall not be used for side pulls.



## Operating Rules (continued)



5. Never lower the block below the point where less than two full wraps of rope remain on the hoist drum.

Should all the rope be unwound from the drum, be sure it is rewound in the correct direction and seated properly in the drum grooves.



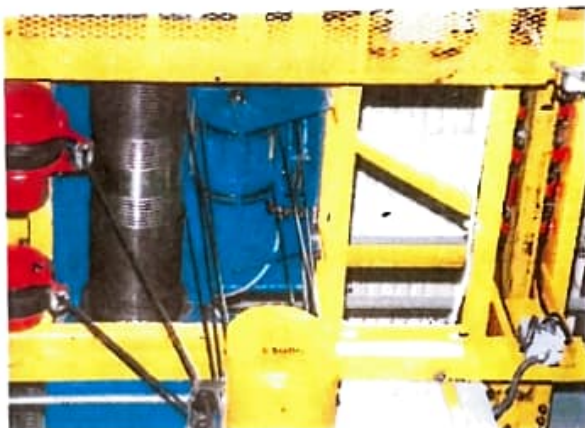
6. Sound the warning device (if provided) when raising, lowering or moving loads wherever people are working to make them aware that a load is being moved.



7. Do not make lifts beyond the rated load capacity of the crane, lifting beam, slings, shackles or other devices.



## Operating Rules (continued)



8. Upper limit switches (and lower limit switches, when provided) shall be tested for stopping the hoist at the beginning of each shift or as frequently as otherwise directed.

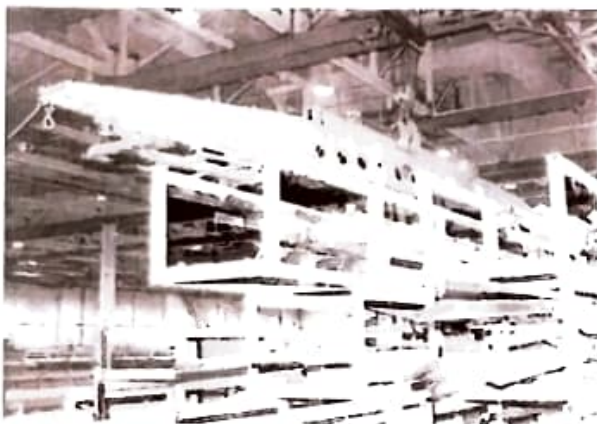


9. Before moving a load, make certain the rigging or other load lifting devices are fully seated in the saddle of the hook.



10. On all capacity or near capacity loads, the hoist brakes should be tested by returning the master switch or push-button to the "OFF" position after raising the load a few inches off the floor. If the hoist brakes do not hold, set the load on the floor and do not operate the crane. Report the defect immediately to the Supervisor.

## Operating Rules (continued)



11. Check to be sure that the load is lifted high enough to clear all obstructions and personnel when moving bridge or trolley. NEVER move suspended loads over personnel.



12. While the load is suspended by the crane, the operator shall remain at the controls.



13. When both a rigger and crane operator are involved in moving a load, it is their joint responsibility to see that hitches are secure and that all loose material has been removed from the load before starting a lift. Watch for pinch points and hazards of load handling when additional personnel help with the load.



## Operating Rules (continued)



14. Crane operators shall not use limit switches to stop the hoist under normal operating conditions. (These are emergency devices and are not intended to be used as operating controls.)

Do not lift loads with any sling hooks hanging loose. (If all sling hooks are not needed, they should be properly stored or use a different sling.)



15. All excess slings should be removed from the crane hook or lifting beam when not needed for a lift. Dangling slings can snag other objects while the crane is moving.

Do not lift loads with any sling hooks hanging loose. (If all sling hooks are not needed, they should be properly stored or use a different sling.)



16. Never move loads carried by magnets or vacuum devices over anyone. Loads held magnetically or by a vacuum may drop. Power failure to magnets or vacuum devices will result in dropping the load unless a backup power supply is furnished.



## Operating Rules (continued)



17. If the electric power goes off or before closing main or emergency switches, place your controllers in the "OFF" position and keep them there until power is restored. Turn off the main power switch on the Control Box.

On the Control Box, the levers should always spring back to a middle neutral position when released by the operator.



18. Never operate a crane that has an "OUT OF ORDER" or "DO NOT OPERATE" card on it. Obey lock out, tag out (LOTO) procedures.



19. Before removing the "DO NOT USE" or "LOTO" Tags or cards on the disconnect switch, it is necessary to make a careful check to determine that no one else is working on the crane or is in the crane's travel path.

## Operating Rules (continued)



20. Always confirm that the crane's bridge and trolley bumpers are in good condition.



21. Never use a crane to ram or bump another crane.



22. Do not attempt to repair electrical apparatus or make other major repairs on the crane unless specific authorization has been received. Never bypass any electrical limit switches or warning devices.

## Operating Rules (continued)



23. A warning sign or signal should be displayed and the main switch should be locked in the "OFF" position in cases of emergencies, during inspections or maintenance. This should be done by the crane operator or by other personnel. Obey lock out, tag out (LOTO) procedures.



24. Always respect warning devices, such as rail and bridge stops. Never attempt to enter an area with a crane which has been flagged for service.



25. Fully engage all lifting devices with their load before hoisting.



## Operating Rules (continued)



26. When being assisted by others, the crane operator should follow all signals by the designated signaler.



27. When parking the crane:
- Raise all hooks to an intermediate position.
  - Spot the crane at an approved designated location.
  - Place all controls in the "OFF" position.
  - Make a visual check before leaving the crane.

What's wrong with this picture?

ANSWER:

Crane block has been parked too close to floor. Should be near upper third of hoist range, away from snagging with obstructions, fork lifts, lift-a-lofts, etc.

## Operating Rules (continued)



28. Never move the load without properly inching in the direction of travel, in order to avoid erratic swinging of the load. Remember to always **LOOK UP** and ensure a good travel path.



29. One measure of a good crane operator is the smoothness of operation of the crane. Jumpy and jerky operation, flying starts, quick reversals and sudden stops are the "trademarks" of the careless operator. A good operator knows and follows these tried and tested rules for safe and efficient crane handling.  
**NO COWBOY OPERATING!**







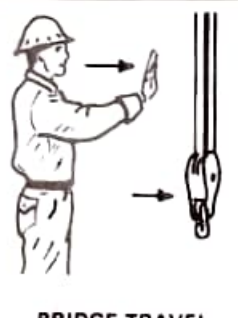





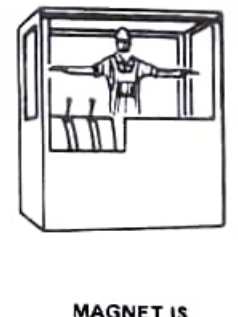
## CHAPTER 5

# Hand Signals

### Chapter 5 Objective:

The trainee will be able to demonstrate proper hand signals for Overhead Crane.



 <p><b>HOIST</b> With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>	 <p><b>LOWER</b> With arm extended downward, forefinger pointing down, move hand in small horizontal circles.</p>	 <p><b>BRIDGE TRAVEL</b> Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>
 <p><b>TROLLEY TRAVEL</b> Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.</p>	 <p><b>STOP</b> Arm extended, palm down, move arm back and forth.</p>	 <p><b>EMERGENCY STOP</b> Both arms extended, palms down, move arms back and forth.</p>
 <p><b>MULTIPLE TROLLEYS</b> Hold up one finger for block marked "1" and two fingers for block marked "2." Regular signals follow.</p>	 <p><b>MOVE SLOWLY</b> Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)</p>	 <p><b>MAGNET IS DISCONNECTED</b> Crane operator spreads both hands apart, palms up.</p>

## Stay Alert

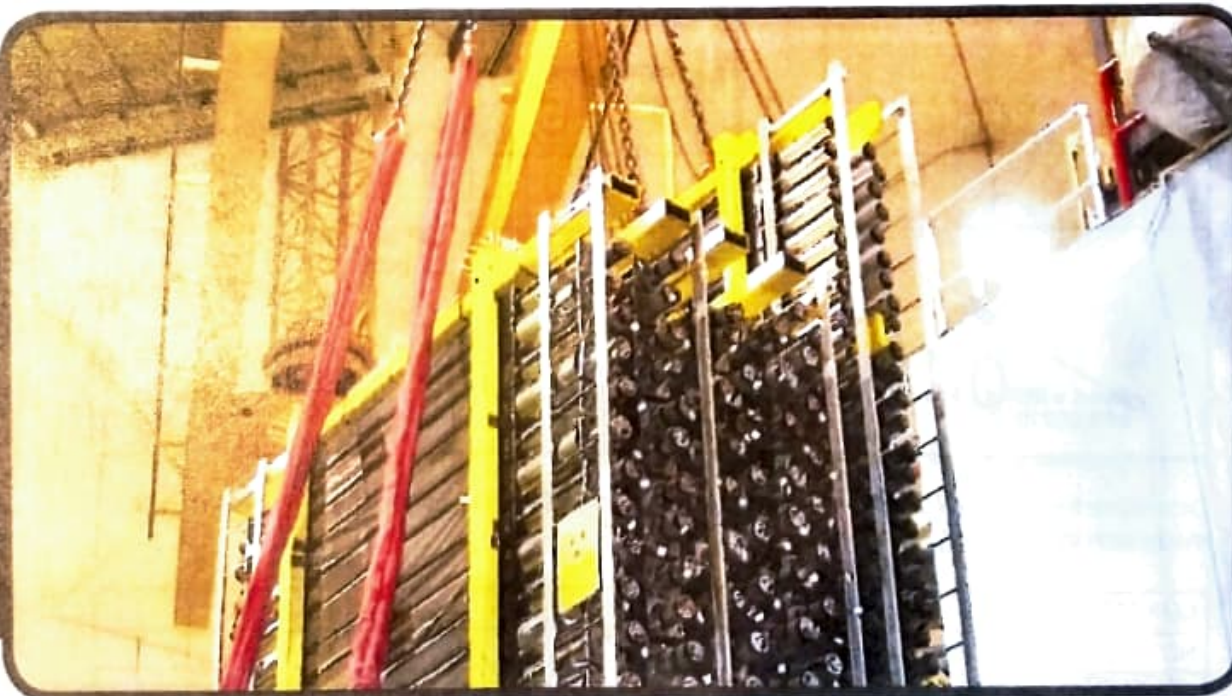
The crane operator should keep their hands on the controller or master switches which control the crane motions so stops can be made quickly in case of an emergency. Stand up when necessary to improve vision, when making a lift or when moving a load in any direction. Be especially alert for any unusual sounds or warnings. Danger may be present where the crane operator cannot see.

## CHAPTER 6

# Rigging

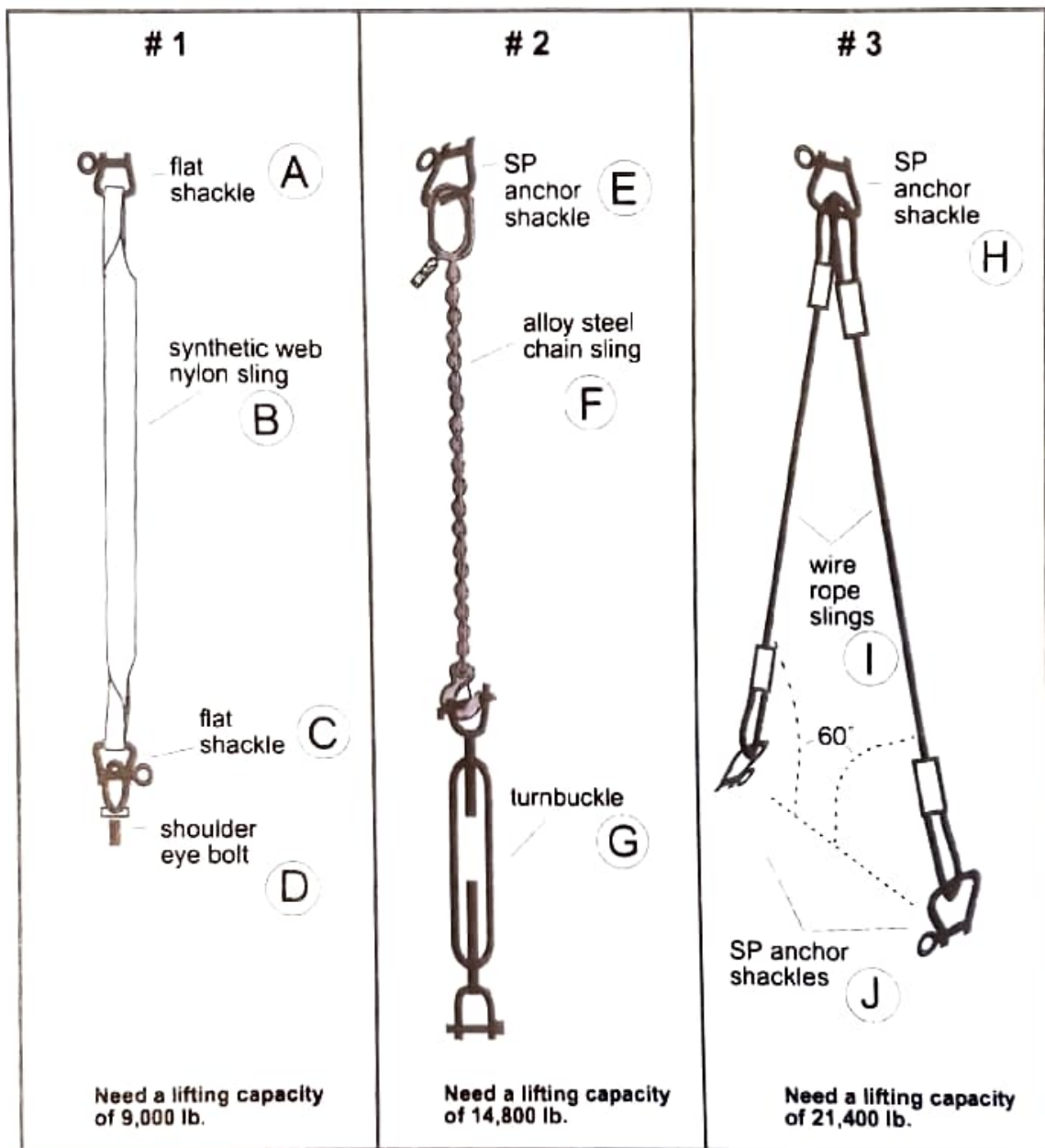
### Chapter 6 Objective:

The trainee will be able to select proper sling length and be able to choose the sling configuration to maintain control of the load.





## Selecting Proper Sling Length



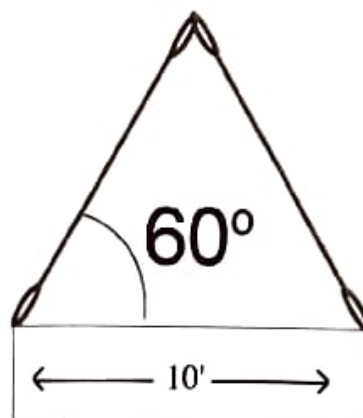
Determine the size and capacity of each piece of rigging gear according to the required lift to be made with the assembly.

GEAR PC.	A	B	C	D	E	F	G	H	I	J
SIZE										
CAPACITY										

**Problem #1**

Load Width = 10'

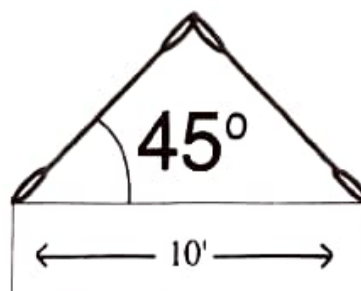
Minimum Sling Length = \_\_\_\_\_



**Problem #2**

Load Width = 10'

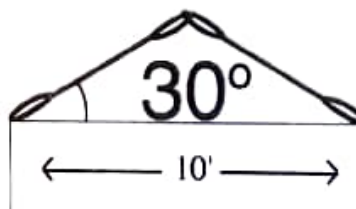
Minimum Sling Length = \_\_\_\_\_



**Problem #3**

Load Width = 10'

Minimum Sling Length = \_\_\_\_\_



**Problem #4**

What is the minimum length of slings?

\_\_\_\_\_

What minimum size wire rope slings should be used?

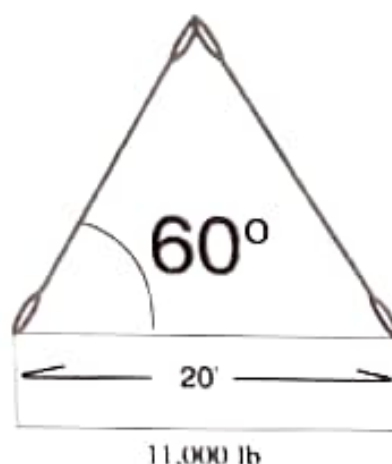
\_\_\_\_\_

What minimum size flat web slings should be used?

\_\_\_\_\_

What minimum size chain slings should be used?

\_\_\_\_\_



**Problem #5**

What are the minimum sling lengths?

\_\_\_\_\_

What minimum size wire rope slings should be used?

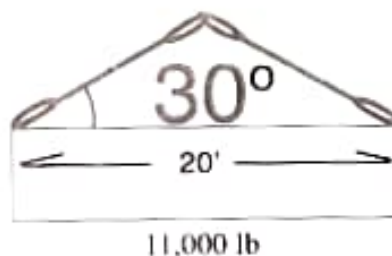
\_\_\_\_\_

What minimum size flat web slings should be used?

\_\_\_\_\_

What minimum size chain slings should be used?

\_\_\_\_\_





## Load Control

Circle the load and rigging illustration in each box which represents the best method of rigging from a load control standpoint. (Identify why its alternate is not as safe.)

<p>1.</p>	<p>2.</p>
<p>3.</p>	<p>4.</p>
<p>5.</p>	<p>6.</p>

**Notes:**

## **CHAPTER 7**

# **Twirling Coils**

### **Chapter 7 Objective:**

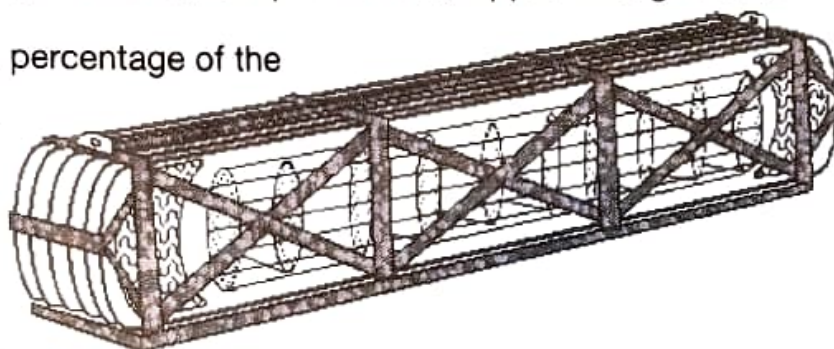
The trainee will be able to recognize and understand the elements which can contribute to an overhead crane accident.





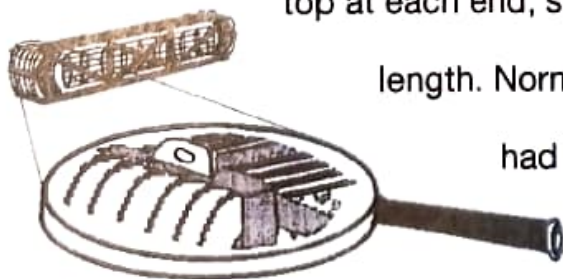
The maintenance crew for a large manufacturing facility was assigned the task of pulling a group of large heat reduction coil units out of service and transporting them to the plant's repair shop. A pendant-controlled 10 ton capacity overhead bridge crane was available for the job. Coil unit #334A was 4' x 4' x 16', and its empty weight was approximately 17,530 lbs. Three-quarter inch copper tubing, which made up a large percentage of the

coil unit, carried water through numerous cooling stations and then passed



it onto the next unit for further heat reduction. The unit's in-take and out-flow valves were closed and had trapped slightly under 585 gallons of water in the coil system.

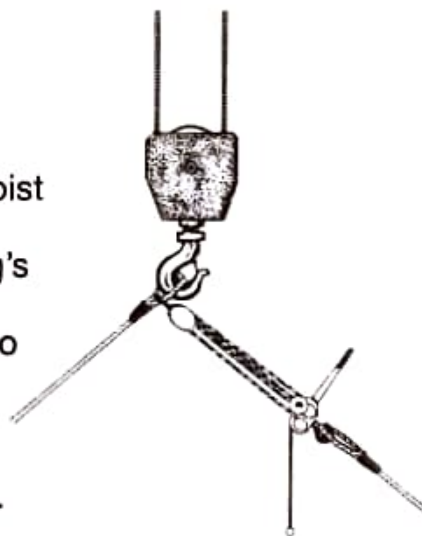
The coil unit's steel framework had a lifting lug (pad eye) welded on the top at each end, sitting perpendicular to the unit's length. Normally a lifting beam (strongback) had been used to transport the coil units since available headroom



was at a bare minimum. The lifting beam's underside pad eyes were damaged so the beam was unavailable.

Using two 1" shackles (8.5 ton cap.) the maintenance crew attached a 7/8" x 10' sling to the unit's west end and a 7/8" x 6' sling (both wire rope slings) to the east end.

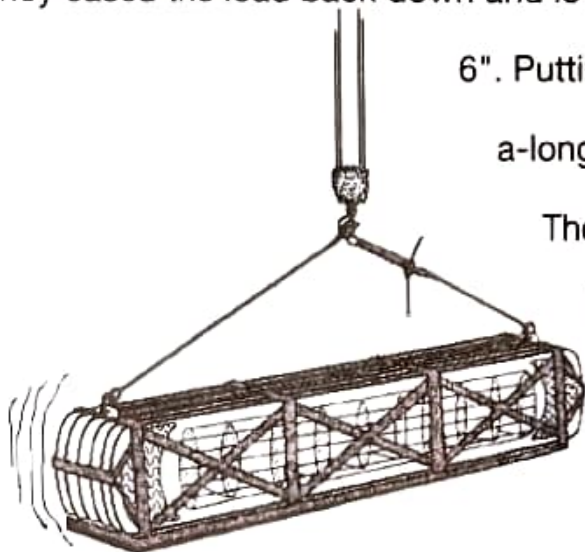
One hook of a 6 ton capacity chain lever hoist (come-a-long), was hooked into the 6' sling's free eye and the other hook was attached to the 10' sling's eye at the crane hook. The sling angle from horizontal was 35 degrees.



After loosening the coil unit's base bolts and disconnecting the piping which led to other surrounding units, the crew prepared to make the lift. The crew foreman told one of the millwrights to "jog" the hoist button until all of the slack was out of the hoist rope, slings and come-a-long.

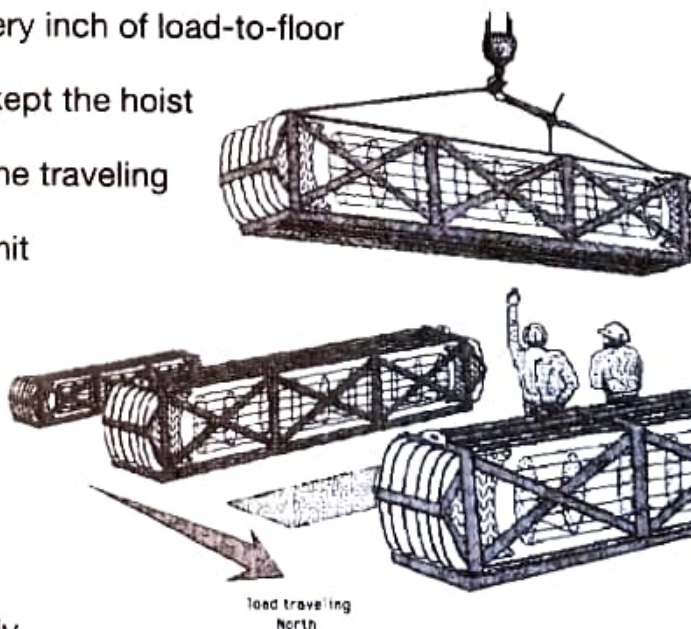
Since the hook was fairly centered over the load the foreman gave the "hoist the load" signal to the operator. The west end started up with no movement on the east end.

They eased the load back down and lowered the hook an additional 6". Putting a cheater pipe on the come-a-long handle they began ratcheting.



The moment they saw the east end begin to raise, they stopped ratcheting and signalled for the operator to hoist the load.

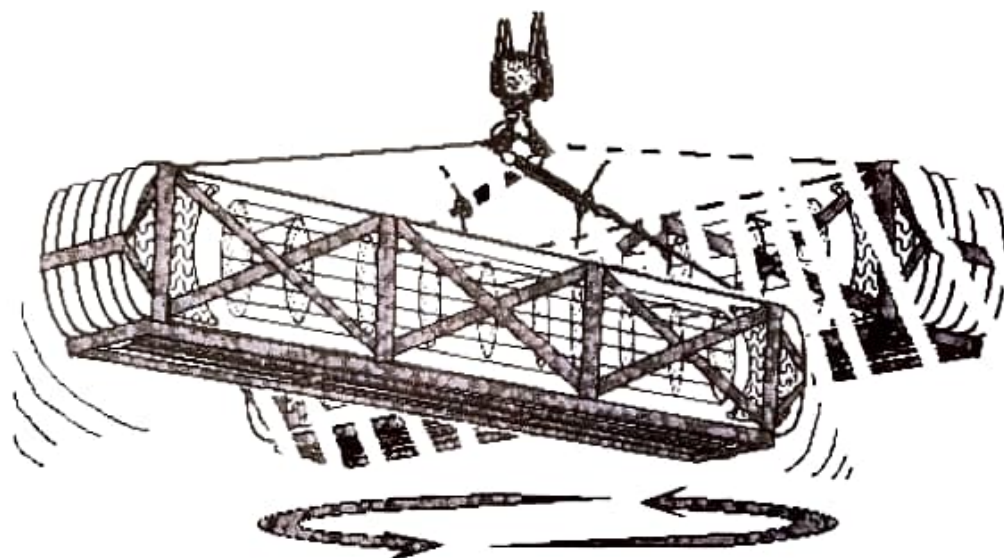
The foreman and a helper stayed on the north broadside of the coil unit, to help make sure nothing went wrong. They stood with their backs against another coil unit, approx. four feet away. Since the operator knew he would need every inch of load-to-floor clearance available, he kept the hoist button depressed until the traveling block struck the hoist limit switch. The limit switch stopped the hoisting mode.



The operator immediately started to travel the load north and trolley east. As the load started



to pendulum slightly the operator tried to "plug" (reverse-power) the trolley east button in an effort to inhibit the swinging. By mistiming the "plugging", the load accelerated its swing action, and a corner of the coil unit clipped a solvent tank used to pre-coat raw materials. After clipping the tank, the load started spinning like a Tilt-A-Whirl at the carnival.

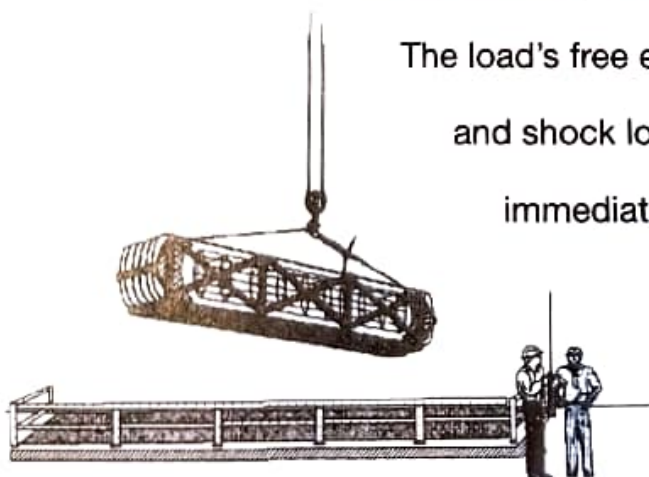


After their coffee break the crew came back to the now stabilized load, and a new crew member was assigned to the pendant control. He started traveling the load gently to the building's north end. As the bridge crane approached the end of the runway at approx. 2 m.p.h., he allowed the rail stops to end the crane's travel, guaranteeing the crane was as far north as possible.

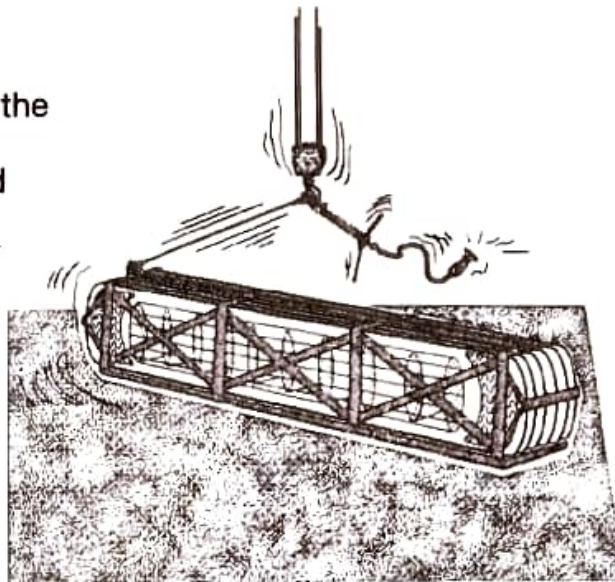
A 20' x 30' opening had been cut into the floor at the building's north end for these types of operations, and the coil unit would be lowered through the opening onto a flat bed trailer at ground level, one floor below. A truck driver stood on the trailer's wooden deck looking up as the crew prepared to lower the load.

The operator jammed the "lower" button in with a toothpick and the coil unit began its descent. The other crew members went down to ground level to help place the load onto the trailer. The operator turned to talk with his brother-in-law, a machine operator, about all of the problems the crew had experienced with this load. The end of the load with the 6' sling and come-a-long, hung-up on the opening's north rim. The hook descended 4' before the load slid off the rim. The impact popped off the welded pad eye on the come-a-long end.

The load's free end fell in a downward arc and shock loaded the 10' sling, which immediately failed.



The coil unit did a nose-dive through the flat bed and grazed the truck driver. He was hospitalized with a smashed left shoulder, a shattered collar bone, several broken ribs and lacerations.





### *Accident Case Study Score Sheet*

After reading the preceding case study thoroughly, identify and list all of the improper rigging practices and crane related decisions. Your team must be very specific about the items listed so points may be awarded. The scoring judge must be able to easily understand the whys & whatfors of the items you have identified.

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## CHAPTER 8

# Hands On

### Chapter 8 Objective:

The trainee will demonstrate proper practices by successfully rigging and moving a variety of test loads using an overhead crane.



## Overhead Crane Operation Evaluation Form

Value	Crane Type:	Load 1	Remarks	Load 2	Remarks
	<b>PRE-OP CHECK</b>				
1	Damage				
1	Leakage				
1	Runway (clear)				
1	Markings				
1	Control conditions (pendant electrical wiring)				
	<b>OPERATIONAL CHECKS</b>				
4	Limit switches (hoist upper, lower, trolley, bridge)				
3	Control functions				
3	Hoist rope (main and auxiliary)				
3	Hooks (safety latch, 15 percent open or 10 degree twist)				
3	Spooling				
2	Brakes				
	<b>OPERATING UNLOADED</b>				
2	Hoisting speed				
2	Block height				
2	Trolley travel (stops before reversing)				
2	Bridge travel (stops before reversing)				
	<b>LOADING</b>				
4	Load stable				
5	Hook over CG				
10	Load rigged properly				
2	Rig on hook properly				
5	Load weight verified				
	<b>OPERATING LOADED</b>				
5	Check obstruction				
5	Head height				
5	Vertical lift (no side pull)				
5	Horizontal travel (speed, swinging load)				
1	Taglines				
1	Safe load height				
	<b>UNLOADING</b>				
3	Safe landing (floor loading capacity)				
2	Sets load slowly				
2	Vertical lowering (no side pull)				
3	Signals (follows signals-headset/hand)				
	<b>PARKING</b>				
3	Safe area (designated area)				
3	Load block (safe height)				
2	Rigging stored				
3	Power off (pendant out of traffic)				
100	<b>TOTAL</b>		75 pts. or more per load is passing		
<p>Operator's Name: _____ Pass: <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Company: _____</p> <p>Instructor: _____</p> <p>Date: _____</p>					

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, typical of notebook paper. There is no handwriting or other markings on the page.



# REFERENCES

## Standards & Regulations

## References

### Inspection Criteria for Overhead Cranes (According to ASME B30.2)

#### Frequent Inspections

- Frequent inspection shall include observations during operation.
- A designated person shall determine whether conditions found during the inspection constitute a hazard and whether a more detailed inspection is required.
- The following items shall be included in a frequent inspection:
  1. Operating mechanisms for proper operation, proper adjustment and unusual sounds
  2. Upper-limit device(s) according to ASME B30.2
  3. Tanks, valves, pumps, lines and other parts of air or hydraulic systems for leakage
  4. Hooks and hook latches (if used) according to ASME B30.10
  5. Hoist ropes and end connections according to ASME B30.2
  6. Rope for proper spooling onto the drum(s) and sheave(s)

#### Periodic Inspections

- A designated person shall determine whether conditions found during the inspection constitute a hazard and whether disassembly is required for additional inspection.
- The following items shall be included in a periodic inspection:
  1. Deformed, cracked or corroded members
  2. Loose or missing bolts, nuts, pins or rivets
  3. Cracked or worn sheaves and drums
  4. Worn, cracked or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers and stops
  5. Excessive wear of brake system parts
  6. Excessive wear of drive chain sprockets and excessive drive chain stretch
  7. Deterioration of controllers, master switches, contacts, limit switches and push-button stations, but not limited to these items
  8. Wind indicators for proper operation
  9. Gasoline, diesel, electric, or other power plants for proper operation
  10. Motion-limit devices that interrupt power or cause a warning to be activated for proper performance. Each motion shall be inched or operated at low speed into the limit device with no load on the crane
  11. Rope reeving for compliance with crane manufacturer's design
  12. All function, instruction, caution, and warning labels or plates for legibility and replacement

## References

### Inspection Criteria for Overhead Cranes (According to 29 CFR 1910.179)

Dated Inspection Reports or comparable records shall be made on critical items such as hoisting machinery, sheaves, hooks, chains, ropes and other lifting devices as listed in ASME B30.2. Records should be available to appointed personnel.

### Frequent Inspection

- The following items shall be inspected for defects at intervals (Frequent: Daily to monthly intervals), including observation during operation for any defects which might appear between regular inspections. All deficiencies such as listed shall be carefully examined and a determination made as to whether they constitute a safety hazard:
  1. All functional operating mechanisms for maladjustment interfering with proper operation. Daily.
  2. Deterioration or leakage in lines, tanks, valves, drain pumps and other parts of air or hydraulic systems. Daily.
  3. Hooks with deformation or cracks. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and the serial number or other identifier of the hook inspected. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10 degrees twist from the plane of the unbent hook. Crane hooks showing defects described above shall be discarded. Repairs by welding or reshaping are not generally recommended. If such repairs are attempted they shall only be done under competent supervision and the hook shall be tested to load requirement in 29 CFR 1910.179(k)(2) before further use.
  4. Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function or stretch beyond manufacturer's recommendations. Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain which was inspected.
  5. All functional operating mechanisms for excessive wear of components.
  6. Rope reeving for non-compliance with manufacturers recommendations.



## References

### Inspection Criteria for Overhead Cranes (According to 29 CFR 1910.179)

#### Periodic Inspection

- Complete inspections of the crane shall be performed at periodic intervals (1 to 12 month), depending upon activity, severity of service, and environment, or as specifically indicated below. Any deficiencies such as listed shall be carefully examined and a determination made as to whether they constitute a safety hazard:
  1. Deformed, cracked or corroded members
  2. Loose bolts or rivets
  3. Cracked or worn sheaves and drums
  4. Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices
  5. Excessive wear on brake system parts, linings, pawls and ratchets
  6. Load, wind, and other indicators over their full range, for any significant inaccuracies
  7. Gasoline, diesel, electric or other power plants for improper performance or noncompliance with applicable safety requirements
  8. Excessive wear of chain drive sprockets and excessive chain stretch
  9. Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and push-button stations



# OVERHEAD CRANE OPERATOR

Student Workbook



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